4.2 PSAP Reroute Enhanced Wireless Emergency Call

This scenario describes an Emergency Services Call initiated by an MS and routed (based on Emergency Services Routing Digits) to an initial PSAP (PSAP A). PSAP A's agent determines another PSAP (PSAP B) is appropriate to respond to the Emergency Services Call and reroutes the call to PSAP B.

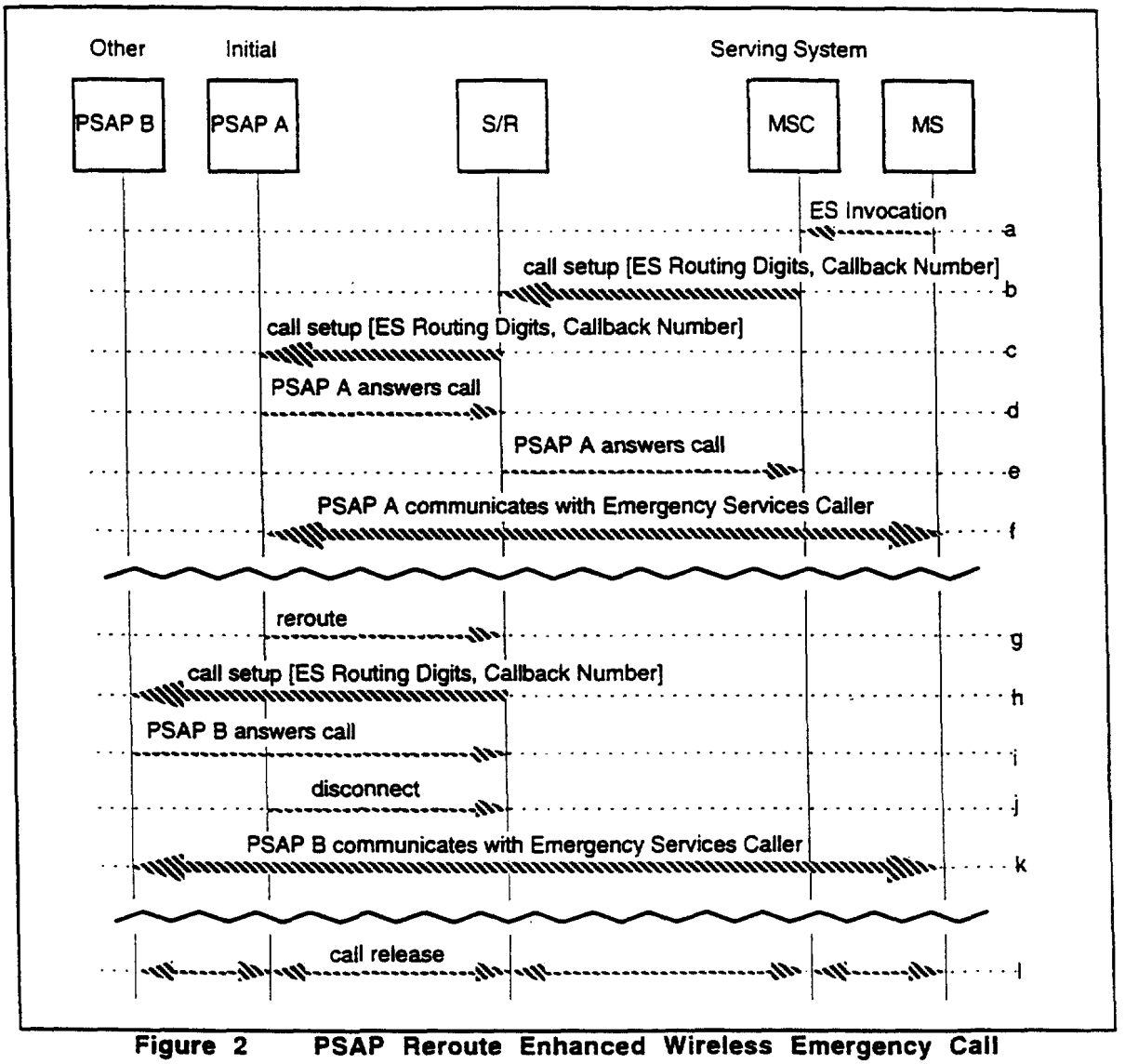

Figure 2 PSAP Reroute Enhanced Wireless Emergency Call

a. An MS initiates an Emergency Services Call (e.g., dials 9-1-1).

b. The Serving MSC, recognizing that an emergency call is being dialed, routes the call over dedicated facilities to a Selective/Router (S/R), transmitting the following information:

Information	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cell site or sector. The parameter carrying this information should be encoded as per the protocol used to route the call.	R
Callback Number	The Directory Number provided to call back the Emergency Services Caller.	R

c. The S/R forwards the call to the Initial PSAP (PSAP A). This routing decision may take into account the location of the MS, time of day, etc. Information passed is same as Step-b.

Note: Interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are shown for illustrative purposes.

d. PSAP A answers by connecting to the Emergency Services Caller and returning answer supervision to the S/R.

e. The S/R forwards PSAP A's answer supervision signal to the Serving MSC.

f. PSAP A's agent communicates with the Emergency Services Caller and determines that another PSAP (PSAP B) is appropriate to respond to the emergency.

g. PSAP A's agent initiates a reroute (to the PSAP B) request to the S/R.

h. The S/R forwards the call to PSAP B. Information passed is same as Steb-b.

i. PSAP B answers by connecting to the Emergency Services Caller and returning answer supervision to the S/R.

j. PSAP A's agent hangs up, PSAP A initiates disconnect of the call to the S/R.

k. PSAP B's agent communicates with the Emergency Services Caller and provides an appropriate response to the emergency.

l. The call is released.

4.3 Tandemed Delivery Wireless Enhanced Emergency Services Call

This scenario describes an Emergency Services Call that is tandemed through an intermediate switch using ISUP, which does not have selective routing capabilities.

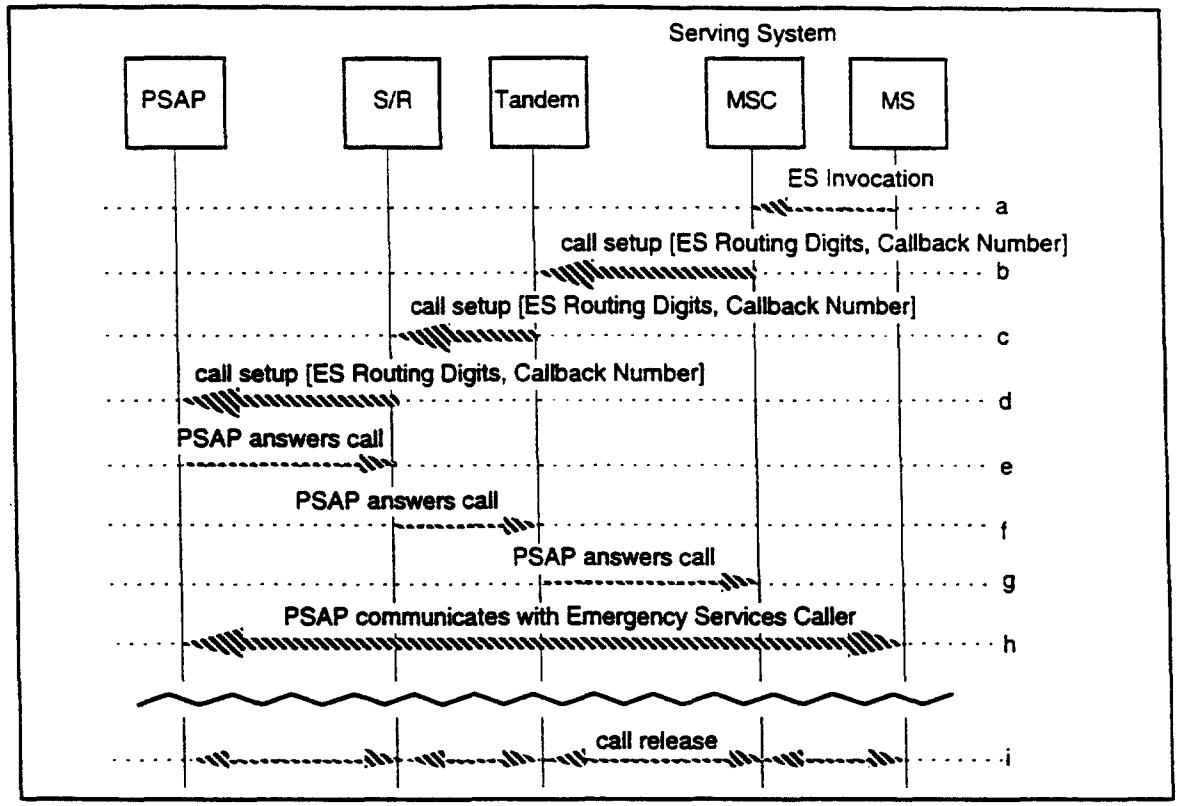

Figure 3 Tandemed Delivery Wireless Enhanced Emergency Services Call

a. An MS initiates an Emergency Services Call (e.g., dials 9-1-1).

b. The Serving MSC, recognizing that an emergency call is being dialed, routes the call to a tandem switch, transmitting the following information:

Information	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cell site or sector. The parameter carrying this information should be encoded as per the protocol used to route the call. Information may also be included that will cause PSTN routing to terminate at the appropriate Emergency Services Network Entity. This number need not be a dialable number. For example, the office code of 911 could be used (e.g., 403-911-1234) to allow routing without the consumption of directory numbers.	R
Callback Number	The Directory Number used to call back the Emergency Services caller.	R

c. The tandem switch, using normal routing, routes the call toward the S/R. Multiple tandem switches may be involved. Information passed is same as Step-b.

d. The S/R forwards the call to the appropriate PSAP. This routing decision may take into account the location of the MS, time of day, etc. Note that interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are just shown for illustrative purposes.

e. The PSAP answers by connecting to the Emergency Services Caller and returning answer supervision to the S/R.

f. The S/R forwards the PSAP's answer supervision signal to the tandem switch.

g. The tandem switch forwards the PSAP's answer supervision signal to the Serving MSC.

h. The PSAP's agent communicates with the Emergency Services Caller and provides an appropriate response to the emergency. Information passed is same as Step-b.

i. The call is released.

4.4 PSAP Callback Using MS's Directory Number

This scenario describes an Emergency Services Call followed, at some later time, by a callback from the PSAP using the Directory Number supplied by the signaling during the Emergency Services Call setup.

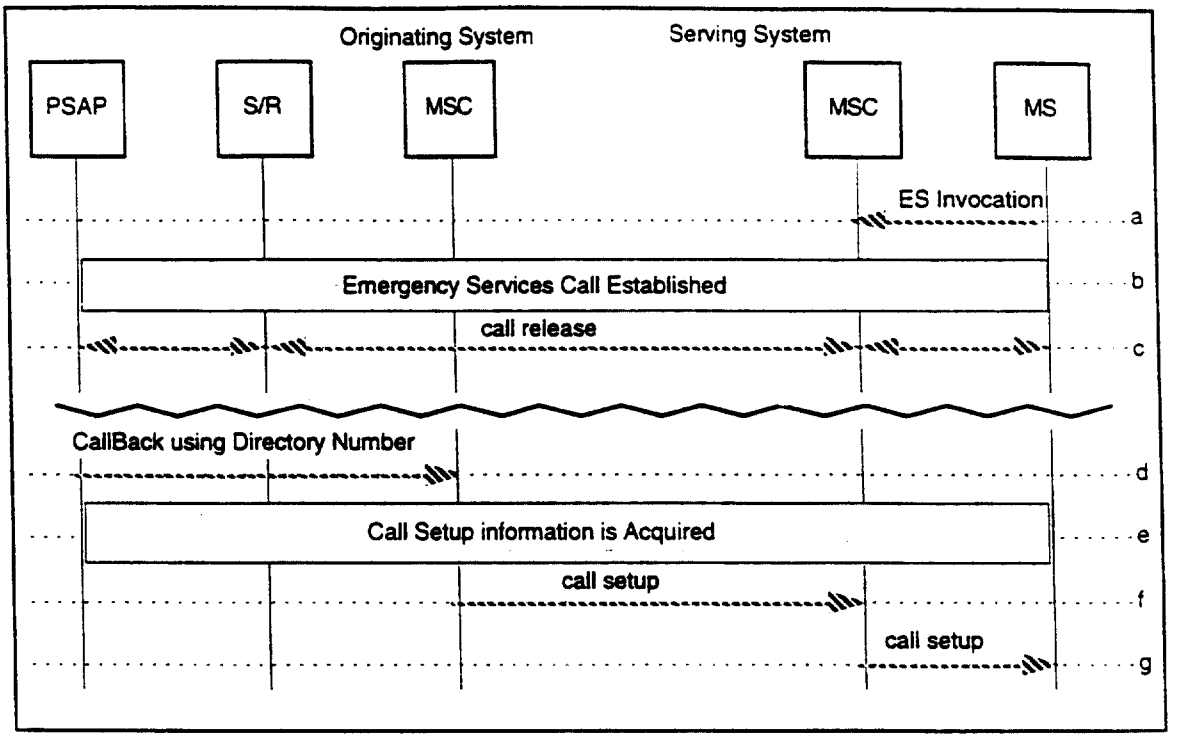

Figure 4 PSAP Callback Using the MS's Directory Number

a. An MS initiates an Emergency Services Call (e.g., dials 9-1-1).

b. An emergency call is set up.

c. The call is released.

d. Some time later, the PSAP determines that it needs to contact the Emergency Services Caller and dials the Directory Number that was delivered to it during Step-b.

e. Normal call delivery ensues, with no guarantee that terminating features or restrictions will not prevent the call delivery or redirect the call (e.g., to a forward-to number).

f. If successful, the call is delivered to the Serving MSC.

g. This MSC will be unaware that this is a PSAP callback and will continue with normal Call Delivery procedures.

4.5 Emergency Call Reconnect

This scenario describes a reconnect to the PSAP after loss of radio contact to the MS during an Emergency Services Call.

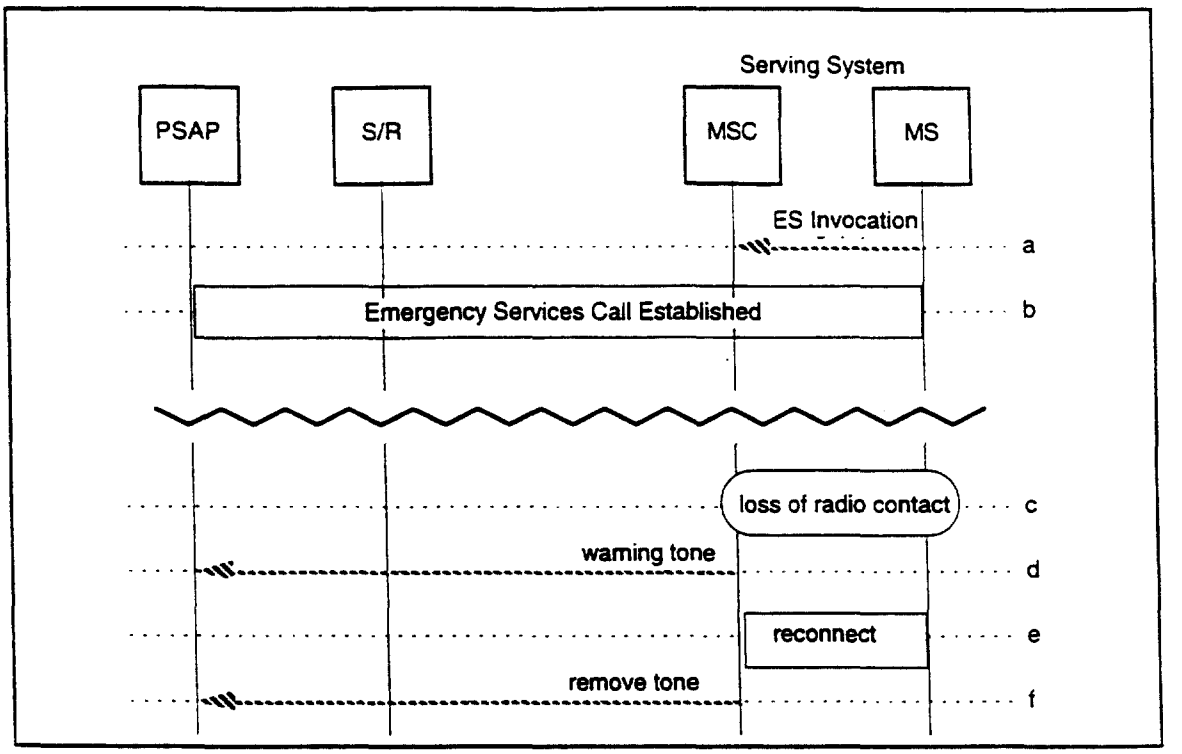

Figure 5 Emergency Call Reconnect

a. An MS initiates an Emergency Services Call (e.g., dials 9-1-1).

b. An emergency call is setup to the PSAP.

c. The MS disconnects due to an abnormal condition (e.g., loss of radio synchronization).

d. The Serving MSC determines that emergency reconnect should be provided. It may provide an in-band warning tone to the PSAP (e.g., low tone).

e. Reconnection between the Serving MSC and the MS is attempted.

f. If the MS is reconnected, the warning tone is removed by the Serving MSC. If the MS was unable to be reconnected, the PSAP trunk could be connected to a recorded announcement or a distinct tone (e.g., reorder).

WIRELESS ENHANCED EMERGENCY SERVICES:
TIA/EIA-41 INTERSYSTEM HANDOFF MODIFICATIONS

CONTENTS

LIST OF FIGURES

LIST OF TABLES

None

FOREWORD

This Foreword is not part of this Interim Standard.

This is one of a series of recommendations titled

"WIRELESS ENHANCED EMERGENCY SERVICES"

which provides a solution for the limited capabilities of Wireless Enhanced Emergency Services. These capabilities include:

- provision of base station, cell site or sector identification information
- subscriber identification
- callback
- reconnect

The recommendations included in this series are:

- J-STD-034.1, Wireless Enhanced Emergency Services: Functional Overview
- J-STD-034.2, Wireless Enhanced Emergency Services: PSAP Perspective
- J-STD-034.3, Wireless Enhanced Emergency Services: Emergency Services Stage 2
- J-STD-034.4, Wireless Enhanced Emergency Services: *TIA/EIA-41* Intersystem Handoff Modifications
- J-STD-034.5, Wireless Enhanced Emergency Services: *TIA/EIA-41* Automatic Roaming Modifications
- J-STD-034.6, Wireless Enhanced Emergency Services: *ANSI J-STD-023* Stage 2 Modifications
- J-STD-034.7, Wireless Enhanced Emergency Services: *TIA/EIA/IS-93* Modifications
- J-STD-034.8, Wireless Enhanced Emergency Services: *TIA/EIA-41* Stage 3 Modifications
- J-STD-034.9, Wireless Enhanced Emergency Services: *ANSI J-STD-024* Modifications

REVISION HISTORY

Revision	Date	Remarks
0	October 1997	Initial Publication

NOTE

The unique numbering system assigned to these documents is intended to reflect their hierarchical structure.

1. INTRODUCTION

1.1 OBJECTIVE

This is one of a series of recommendations titled

"WIRELESS ENHANCED EMERGENCY SERVICES"

which provides a solution for the limited capabilities of Wireless Enhanced Emergency Services. These capabilities include:

- provision of base station, cell site or sector identification information
- subscriber identification
- callback
- reconnect

1.2 SCOPE

This document provides a solution for modifications to TIA/EIA-41 Chapter 2 *Intersystem Handoff Information Flows* to support Wireless Enhanced Emergency Services.

1.3 ORGANIZATION

This document is organized by the following sections:

- Section 1, titled "Introduction," provides introductory information for this Interim Standard.
- Section 2, titled "References," lists the normative and informative references for this Interim Standard.
- Section 3, titled "Terminology," lists the definitions, symbols, abbreviations, and other documentation conventions used in this Interim Standard.
- Section 4, titled "*TIA/EIA-41* Intersystem Handoff Modifications," defines the modifications to the intersystem messaging in *TIA/EIA-41* necessary to support Wireless Enhanced Emergency Services.

2. REFERENCES

The *TIA/EIA-41* recommendations are:

- ANSI/TIA/EIA-41, *Cellular Radiotelecommunications Intersystem Operations; 1997.*

3. TERMINOLOGY

3.1 DEFINITIONS

Callback Number

The Directory Number (e.g., MDN, MSISDN) provided to the PSAP to call back the Emergency Services Caller.

Emergency Services Call

A call requiring connection to a PSAP. The digits 9-1-1 require this treatment in the United States.

Emergency Services Network Entity

An entity which serves as the Emergency Services point of interface to an MSC (e.g., S/R, PSAP).

Public Safety Answering Point

An emergency services network element that is responsible for answering emergency calls.

Selective Router

A Selective Router is an emergency services network element that is responsible for routing incoming emergency calls to the appropriate PSAP, and may be responsible for other functions, such as redirecting calls from a primary PSAP to a secondary PSAP. The specification of Selective Router functionality is outside the scope of this document.

3.2 SYMBOLS AND ABBREVIATIONS

ES	Emergency Services
ESNE	Emergency Services Network Entity
ESRD	EmergencyServicesRoutingDigits parameter
O	Optional
PSAP	Public Safety Answering Point
R	Required
SHH	SpecialHandling parameter
S/R	Selective Router

4. *TIA/EIA-41* INTERSYSTEM HANDOFF MODIFICATIONS

4.1 Emergency Services Call Initiated During a Call After Intersystem Handoff

This scenario describes an Emergency Services Call initiated during a call causing a three-way call (with call processing modifications) following an intersystem handoff. This call will be set up from the Anchor MSC (if an intersystem handoff has occurred). This scenario depicts the 3-flash method along with the alternative 4-flash three-way calling method.

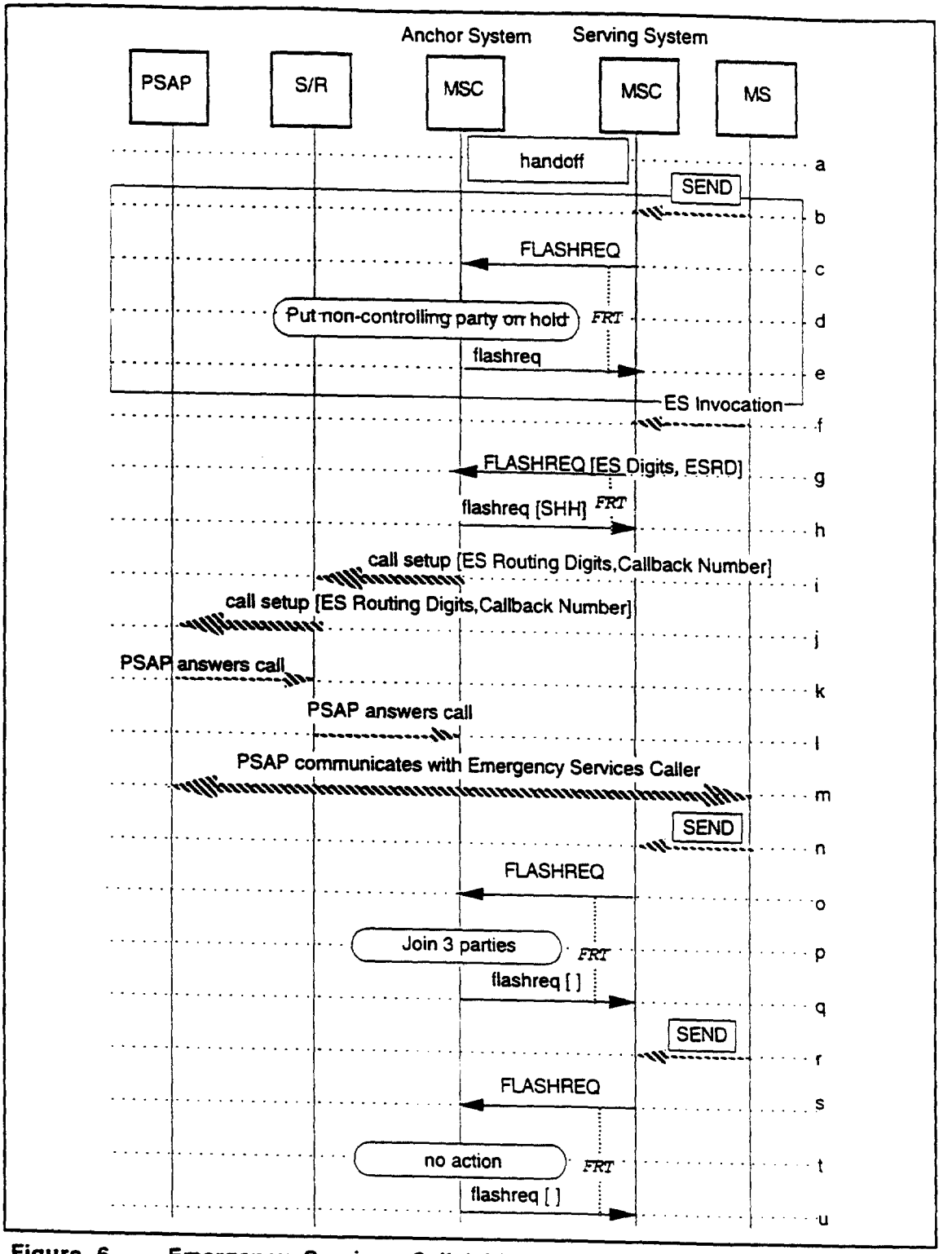

Figure 6 Emergency Services Call Initiated During a Call After Intersystem Handoff

a. A call is handed off from one MSC to another.

b. Later and optionally, the user initiates a multi-way call. Without this option, skip to Step-f.

c. The Serving MSC forwards a FLASHREQ to the Anchor MSC, which determines that the MS has the Three-Way Calling feature active and is in a state able to invoke Three-Way Calling.

d. The Anchor MSC places the non-controlling party on hold and may provide dialtone to the MS.

e. The Anchor MSC responds with a `flashreq` to the Serving MSC.

f. The user initiates an Emergency Services Call.

g. The Serving MSC forwards the ES invocation (e.g., flash digits 9-1-1) to the Anchor MSC in a FLASHREQ, containing the following parameters set to specific values for this scenario:

Parameters	Usage	Type
Digits (Dialed)	These are the digits dialed by the subscriber accompanying the flash. These digits are used by the Anchor MSC to determine if the flash event represents an attempt to place an emergency call.	R
ESRD	EmergencyServicesRoutingDigits. A unique identifier of a specific base station, cell site or sector. If the Anchor MSC determines that an emergency call is being placed, the Anchor MSC uses the ESRD to supply information that will cause PSTN routing to terminate at the appropriate ESNE.	R

h. The Anchor MSC responds with a `flashreq` to the Serving MSC, containing the following parameters set to specific values for this scenario:

Parameters	Usage	Type
SHH	SpecialHandling. Included if the Anchor MSC has determined that the call is an emergency call. The Serving MSC may use this information to provide Emergency Call Reconnect if radio contact with the MS is lost.	O

i. The Anchor MSC, recognizing that an emergency call is being dialed, routes the call to the appropriate Selective/Router (S/R), transmitting the following information:

Information	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cell site or sector. The parameter carrying this information should be encoded as per the protocol used to route the call. Information may also be included that will cause PSTN routing to terminate at the appropriate ESNE. This number need not be a dialable number. For example, the office code of 911 could be used (e.g., 403-911-1234) to allow routing without the consumption of directory numbers.	R
Callback Number	The Directory Number used to call back the caller.	R

j. The S/R forwards the call to the appropriate PSAP. This routing decision may take into account the location of the MS, time-of-day, etc. Information passed is same as Step-i.

Note: interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are shown for illustrative purposes only.

k The PSAP answers by connecting to the Emergency Services Caller and returning answer supervision to the S/R.

l. The S/R forwards the PSAP's answer supervision signal to the Anchor MSC.

m. The PSAP's agent communicates with the Emergency Services Caller.

n. The user presses SEND again.

o. The Serving MSC forwards a FLASHREQ to the Anchor MSC.

p. The Anchor MSC bridges the trunk to the MS, the trunk to the S/R and the trunk to the held party to allow a three-way conversation.

q. The Anchor MSC responds with a `flashreq` to the Serving MSC.

r. The user presses SEND again.

s. The Serving MSC forwards a FLASHREQ to the Anchor MSC.

t. The Anchor MSC takes no action to avoid disconnecting the PSAP from the call.

u. The Anchor MSC responds with a `flashreq` to the Serving MSC.

4.2 Emergency Call Reconnect After Intersystem Handoff

This scenario describes a reconnect to the PSAP after loss of radio contact to the MS during an Emergency Services Call.

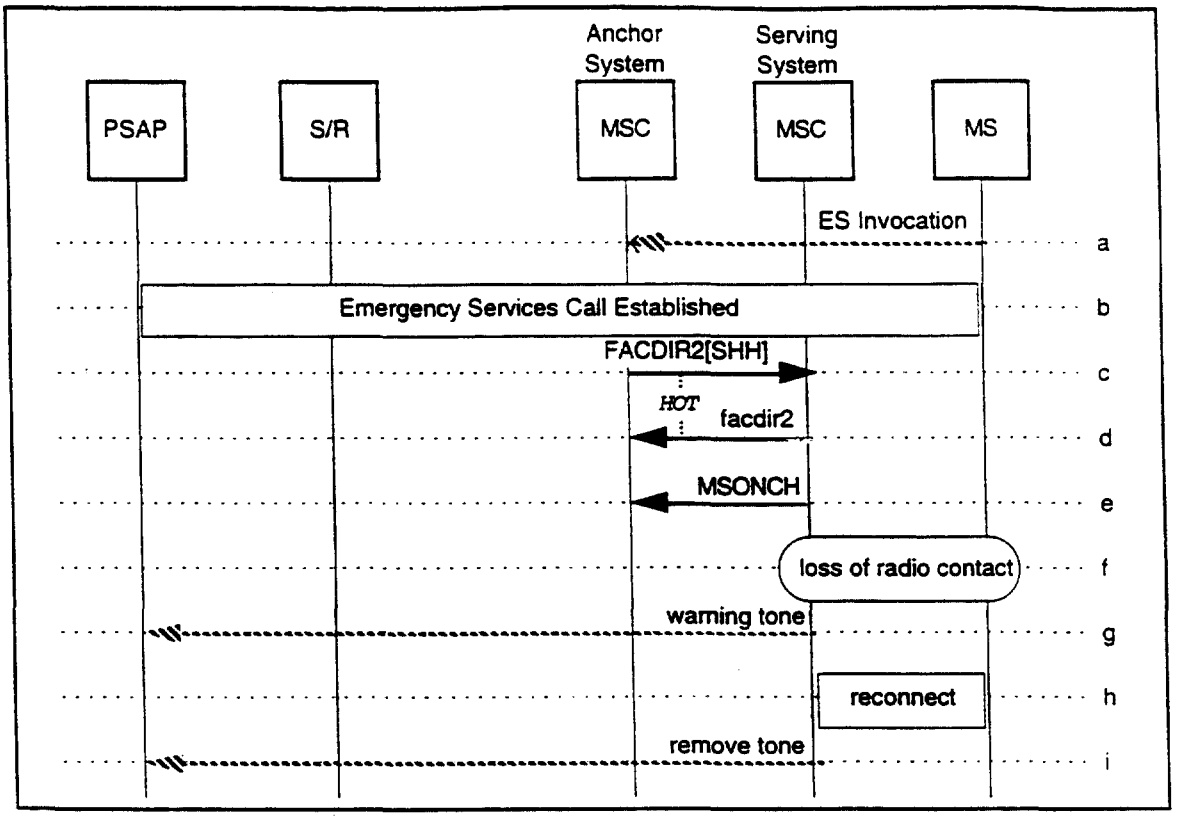

Figure 7 Emergency Call Reconnect After Intersystem Handoff

a. An MS user initiates as Emergency Services Call (e.g., dials 9-1-1).

b. An emergency call is setup (using any of the previous scenarios).

c. An intersystem handoff is initiated through the FACDIR2. It contains the SHH parameter to indicate that an emergency call is being handed off. Note that the SHH parameter is also required in the HANDBACK2 and HANDTHIRD2 messages to support all inter-MSC handoff scenarios.

d. The Serving MSC acknowledges with a facdir2.

e. The Serving MSC reports the arrival of the MS on the new channel with an MSONCH.

f. The MS disconnects due to an abnormal condition (e.g., loss of radio synchronization).

g. The Serving MSC, based on the SHH indicator received from the Anchor MSC at Step-c, determines that emergency reconnect should be provided. It may provide an in-band warning tone to the PSAP (e.g., low tone).

h. The Serving MSC attempts to reconnect the MS (e.g., by paging).

i. If the MS is reconnected, the warning tone is removed by the Serving MSC. If the MS was unable to be reconnected, the PSAP trunk could be connected to a recorded announcement or a distinct tone (e.g., reorder).

WIRELESS ENHANCED EMERGENCY SERVICES:
TIA/EIA-41 AUTOMATIC ROAMING MODIFICATIONS

CONTENTS

LIST OF FIGURES

LIST OF TABLES

None

FOREWORD

This Foreword is not part of this Interim Standard.

This is one of a series of recommendations entitled

"WIRELESS ENHANCED EMERGENCY SERVICES"

which provides a solution for the limited capabilities of Wireless Enhanced Emergency Services. These capabilities include:

- provision of base station, cell site or sector identification information
- subscriber identification
- callback
- reconnect

The recommendations included in this series are:

- J-STD-034.1, Wireless Enhanced Emergency Services: Functional Overview
- J-STD-034.2, Wireless Enhanced Emergency Services: PSAP Perspective
- J-STD-034.3, Wireless Enhanced Emergency Services: Emergency Services Stage 2
- J-STD-034.4, Wireless Enhanced Emergency Services: *TIA/EIA-41* Intersystem Handoff Modifications
- J-STD-034.5, Wireless Enhanced Emergency Services: *TIA/EIA-41* Automatic Roaming Modifications
- J-STD-034.6, Wireless Enhanced Emergency Services: *ANSI J-STD-023* Stage 2 Modifications
- J-STD-034.7, Wireless Enhanced Emergency Services: *TIA/EIA/IS-93* Modifications
- J-STD-034.8, Wireless Enhanced Emergency Services: *TIA/EIA-41* Stage 3 Modifications
- J-STD-034.9, Wireless Enhanced Emergency Services: *ANSI J-STD-024* Modifications

REVISION HISTORY

Revision	Date	Remarks
0	October 1997	Initial Publication

NOTE

The unique numbering system assigned to these documents is intended to reflect their hierarchical structure.

1. INTRODUCTION

1.1 OBJECTIVE

This is one of a series of recommendations titled

"WIRELESS ENHANCED EMERGENCY SERVICES"

which provides a solution for the limited capabilities of Wireless Enhanced Emergency Services. These capabilities include:

- provision of base station, cell site or sector identification information
- subscriber identification
- callback
- reconnect

1.2 SCOPE

This document provides a solution for modifications to *TIA/EIA-41* Chapter 3 *Automatic Roaming Information Flows* to support Wireless Enhanced Emergency Services.

1.3 ORGANIZATION

This document is organized by the following sections:

- Section 1, titled "Introduction," provides introductory information for this Interim Standard.
- Section 2, titled "References," lists the normative and informative references for this Interim Standard.
- Section 3, titled "Terminology," lists the definitions, symbols, abbreviations, and other documentation conventions used in this Interim Standard.
- Section 4, titled "*TIA/EIA-41* Automatic Roaming Modifications," defines the modifications to the intersystem messaging in *TIA/EIA-41* necessary to support Wireless Enhanced Emergency Services.

2. REFERENCES

The *TIA/EIA-41* recommendations are:

- ANSI/TIA/EIA-41, *Cellular Radiotelecommunications Intersystem Operations; 1997.*